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(54) **SAFETY HINGE**

(57) As from a conventional semi-hinge fixed to the frame, a complementary door fixing semi-hinge having, emerging perpendicularly from its base plate (1), a slide (3) destined to be housed in a blind hole on the door edge, a slide which is closed by its free end by means of a lid (12) and having a pair of opposite longitudinal guides (4), in which respective sets of balls have been fitted for the sliding of a runner (8), provided with complementary guides (4') for the mentioned set of balls and which is an elbowed extension of an arm (9) finishing in the bushing (10) or hinge itself, across which this semi-hinge is articulated to the semi-hinge fixed to the frame. Complementarily, slide (3) and runner (8) define a cylindrical housing (5-5') in which a spring (7) is housed, which in the case of the upper hinge tends to press the leaf against the frame and in the case of the lower hinge, tends to separate these components.

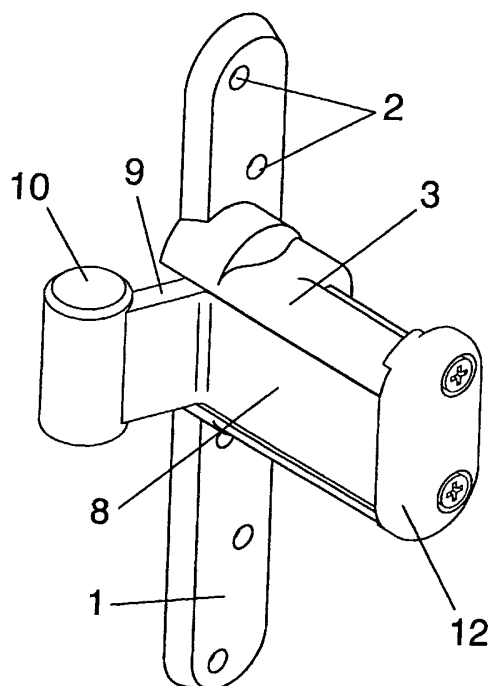


Fig. 7

Description

OBJECT OF THE INVENTION

[0001] The present invention refers to a hinge, intended to constitute the means of hinging doors, windows, traps, and similar devices, whose structural characteristics have been conceived to provide a safety element which, without any special modification, either in the leaf or the frame, prevents the injuries accidentally produced when a person, generally a child, is closing the leaf and has his/her fingers or another part of the body between the leaf and frame in the hinging area.

BACKGROUND OF THE INVENTION

[0002] In any door, window or similar hinged device, between the frame and leaf there is, in the open position of the latter, a considerably wide angle, permitting for example the introduction of fingers such that if the leaf is accidentally closed a severe injury is produced. Therefore, it is necessary to take into account that the force exerted, for example, over a door handle, is multiplied approximately twenty times at the pivot level, due to the lever arm of the door itself, such that injuries may be considerably.

[0003] In an attempt to eliminate this problem, door designs are known which are hinged on their upper and lower faces having an edge and housing in a rounded frame, such that the angle is not formed, solving the aforementioned problem, on not permitting the introduction of fingers or any other part of the body in said space. However, this solution is expensive since it means the replacement of standard doors by special ones.

[0004] The availability of an accordion shaped part is also known, as an extension of the classic stepping of the frame, tending to conceal the aforementioned angle, but this solution, besides negatively influencing the aesthetics of the combination, only partially solves the problem since the risk of accidents continues, now between the hinged leaf and the flat iron itself, although in this case, injuries will be slightly less severe, especially when using an easily yieldable flat iron.

[0005] A third solution consists of using hinges that displaces the door leaf with respect to the frame, when there is an object in the closing area.

[0006] Along this way it is interesting to mention the French patent FR-2571417 in which the upper semi-hinge, instead of being directly fixed to the conventional base plate, which in turn is used to fix the semi-hinge to the corresponding edge of the door, is fixed by means of a mobile arm in which there is a recessed housing containing a rod interlocked to said base plate, so that under normal conditions, the arm of the semi-hinge itself is maintained embedded in the base plate, being jointly mobilised with the latter and the leaf itself, whilst in the event of an obstacle in the closing area, a swinging of the arm is produced with respect to the base plate pro-

voking a distancing of the leaf with respect to the frame, hence preventing damage or injury to objects between these components, such as fingers.

[0007] However, this solution only exerts the effect sought in the upper level of the door, whilst at the lower level, the tendency of the total adaptation between the door and the frame is maintained at all times, making the solution effective in the upper area of the door and practically ineffective in the lower part, which is precisely the area with the greatest risks of accidents, especially with respect to children.

[0008] Likewise, this solution has another evident and severe drawback from the standpoint of the user's safety, being the great pressure to which the skin of the trapped limb is submitted on displacement of the edge when said trapping occurs.

[0009] Finally, from the design standpoint, this solution has the drawback of difficult calibration due to the fact that the elastic component is also supporting.

DESCRIPTION OF THE INVENTION

[0010] The safety hinge proposed by the invention, belonging to the third type of option indicated in the previous section, namely, the group which base their safety on the displacement of the leaf with respect to the frame whenever necessary, completely solves the aforementioned drawbacks, assuring wide functionality both at the upper and lower levels, as well as a perfect uniformity throughout and all the latter parallel to an optimum functionality of the door, window or similar device being considered.

[0011] For this reason and more specifically, as an extension of the conventional fixing plate screwed to the edge of the door, the upper semi-hinge of each hinge is provided with a slide perpendicular to said plate and destined to be housed in a blind recess on the edge of the leaf. Said slide has two longitudinal, parallel, superimposed tracks for displacement by rolling, with the interposition of two sets of balls, a runner, in turn provided with another two tracks opposite to those of the slide and by means of which the latter is related by means of the mentioned sets of balls, a runner which is finished at one of its ends in the hinge itself with an articulated joint to the other semi-hinge.

[0012] As a complement of the described structure, the runner incorporates a grooved and lateral recess in which there is an intermediate and fixed bracket, so that said grooved recess, together with another one defined in the slide, determines a cylindrical housing between both components in the assembly situation thereof, there being in said cylindrical housing, a spring which in the case of the lower hinge of the leaf tends to separate the leaf from the frame, whilst in the case of the upper hinge it tends to bring it closer, so that an effect is obtained compensating the tendency of the door to swing over its same plane, due to the offcentring of its centre of gravity with respect to the hinge axis or, in other

words, it is achieved that the pressure with which leaf displacement is produced with respect to the frame is practically the same along an imaginary hinging line, that is, in all the height of the door.

[0013] Said tracks for the sets of balls between the slide and runner are closed at their ends, the structure described being completed with a lid that closes the inside end of the slide in the bottom of the blind hole of the door and which is provided with two spigots which duly placed opposite the rolling tracks, limit displacement of the balls.

[0014] In this way, the runner run remains limited through its inside end by said lid and through its zone next to the base plate by the spring or guide spigot.

[0015] According to the structure described and specifically compared with the aforementioned French patent, the hinge of the invention offers a series of advantages that are mainly centred on the following aspects:

- There is no rubbing or wear due to using the sets of balls with the added advantage that the use of greases is unnecessary which may deteriorate with the passing of time and jam the mechanism.
- It permits an accurate adjustment of the threshold from which the mechanism starts to operate by means of the appropriate tension springs.
- The mechanism always displaces the leaf following an axis parallel to the trapping force which favours the prevention of injuries.
- The mechanism perfectly functions independently from the opening of the door leaf.
- The door machining is very simple and does not affect its structure, such that the door appearance is completely normal.
- All the integrating components thereof are designed to be easily injected in plastic or metal, although the configuration is also easily adaptable to manufacture by plate stamping.
- Finally and essentially, the force exerted on the trapping is practically independent of the height level at which the latter occurs.

DESCRIPTION OF THE DRAWINGS

[0016] To complete the description being made and with the purpose of better understanding the features of the invention in accordance with an embodiment thereof, a set of drawings is attached which show the following with an illustrative and nonlimiting character:

Figure 1 shows a perspective view of one of the two essential components participating in the hinge proposed by the invention, specifically the slide intended to be fixed to the leaf.

Figure 2 shows an elevation view of the part of the previous figure, along its face adapted to the edge of the leaf.

Figure 3 shows a perspective view of the comple-

mentary runner of the slide of the previous figures. Figure 4 shows a plan view of the same runner.

Figure 5 shows a side elevation view of the runner. Figure 6 shows a lower side perspective of the lid complementing the components of the figures above.

Figure 7 shows a perspective view of the set of figures 1 to 6 once assembled.

Figure 8 shows another perspective of the figure 7 set, from an observation point opposite to said figure.

Figure 9 shows a perspective similar to that of figure 7, of the same set of said figure but partially sectioned to more clearly show its internal structure in the specific case of a hinge intended to be located at the upper hinge level of the leaf.

Figure 10 shows a similar reproduction to that of figure 9 but corresponding to a hinge located on the lower hinge of the leaf.

PREFERRED EMBODIMENT OF THE INVENTION

[0017] In the light of the figures shown, it may be seen how in the proposed hinge, the conventional extended base plate (1), fixed to the door leaf, window or item in question, with the conventional screw holes (2) to said edge, in a greater amount than in the conventional hinge and unaligned to improve the fastening conditions, holes (2) which leave a central area of the hinge free, where the grooved slide (3) is situated and in whose interior two guides (upper and lower) (4) are created, which frame a lateral semi-cylindrical recess (55), said plate (1) having, in coaxial arrangement with respect to the slide (3), a spigot (6) acting as a centring device for a spring (7) acting over a runner (8) intended to longitudinally slide inside the slide (3), provided for such a purpose with guides (4') duly opposite the slide (3) guides (4), so that among them, respective sets of balls are established, not represented in the drawings for greater clarity thereof, said runner (8) emerging from an arm (9) forming an obtuse angle with the same and which terminates in the hinge itself (10), that is, in the vertical bushing where the hinge operates, said runner (8) incorporates another semi-cylindrical groove (5'), complementary to groove (5) of the slide (3), to configure a cylindrical housing for the mentioned spring (7), with the additional particularity that within this groove (5), there is a self or transverse wall (11), discoidal, acting as a seating limit for the spring (7), which in the case of the upper hinge will be located between said bracket (11) and the base plate (1) as shown in figure (9), whilst in the case of the lower hinge as shown in figure (10), it will be located between the bracket (11) and the free end of the guide (3), which is closed by means of a lid (12) conveniently interlocked to the same, in this case the spring (7') being different from the spring (7) of the upper hinge since the tension exerted by one or the other should be different, so that in this way the work is also

different, with the purpose of compensating the tendency of lateral swinging by the door due to off-centring of its centre of gravity with respect to the hinge axis.

[0018] Finally, as observed in figure 6, it should be mentioned that the lid (12) is provided with a pair of spigots (13) on its inner face, aligned with the guides (4) and intended to limit the displacement of the balls, so that they never reach the rear or internal end of the guides (4-4') and more specifically, so that the slide tail always remains more behind than the last ball, since when it starts to roll due to trapping its displacement is twofold that of the balls.

[0019] In this way, by means of the opposed arrangement of the springs (7-7'), also with an opposite operation, and by means of a suitable level of tension in each one of them, it is possible to balance the different efforts at the upper and lower ends of the leaf due to its weight, so that the safety effect is uniform along the entire line of swinging or hinging.

Claims

1. A safety hinge of the type used in doors, windows and similar items whose object is to permit a temporary distancing of the leaf with respect to the frame during closing of the former and due to the possible existence of an obstacle between both components, like for example, fingers, **characterised in that** one of the semi-hinges participating in the same, that corresponding to the leaf, as an extension of the conventional plate (1) for fixing to the leaf edge, incorporates a slide (3) perpendicular to the same, intended to be housed in a blind hole of the leaf, which slide adopts a grooved configuration and internally incorporates two guides (4-4') for respective sets of balls, across which a runner (8) is related to said guide, said runner longitudinally slides within the same, elbowed extension of an arm (9) finished in the hinge (10) itself or bushing in which the hinge axis moves, associated to the other semi-hinge, that fixed to the frame, having foreseen that these slide and runner elements are also related through an elastic component (7) which tends to maintain the runner (8) totally housed within the slide (3) and hence the leaf in the situation of maximum closeness to the frame.
2. A safety hinge according to claim 1, **characterised in that** in the slide (3) there is an internal semi-cylindrical grooving (5) which together with another grooving (5') laterally defined in the runner (8), creates a cylindrical housing for the mentioned elastic component (7), materialised in a suitable tension spring, the base plate (1) from which the slide (3) emerges in axial arrangement with respect to the latter, having a spigot (6) acting as a centring means for said spring (7) while in turn the runner (8) incor-

porates a transverse bracket (11) over which the other end of the spring (7) leans.

3. A safety hinge according to previous claims, **characterised in that** the slide (3) is closed at its free or inside end with the collaboration of a lid (12) provided with a pair of spigots (13) opposite the guides (4) of the slide (3), not affecting the runner (8) guides (4'), so that said spigots limit the displacement of the balls over said guides (4) of the slide (3).
4. A safety hinge according to previous claims, **characterised in that** while in the upper hinge, the spring (7) is established between the base plate (1) of the slide (3) and the runner (8) bracket (11), in the lower hinge, the spring (7') is established with a different level of tension between the bracket (11) of the runner (8) and the lid (12) which closes the slide (3), acting in an opposite direction to the spring (7), so that while the hinge of the upper hinge tends to keep the leaf adapted to the frame, the lower hinge tends to separate said leaf from the frame to compensate the swinging tendency of the door due to the shifting of its centre of gravity with respect to the imaginary hinge line.

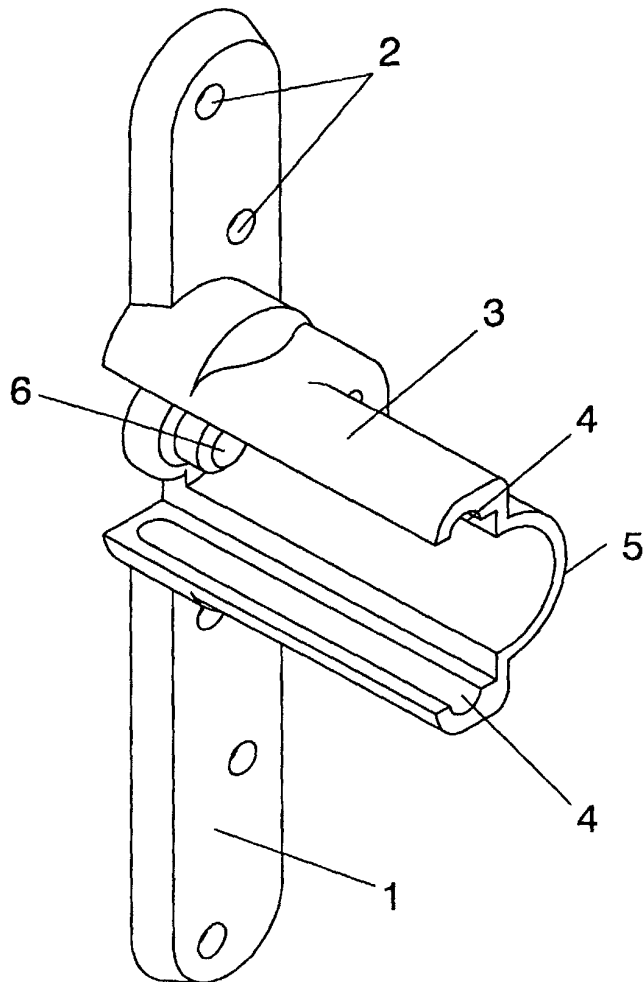


Fig. 1

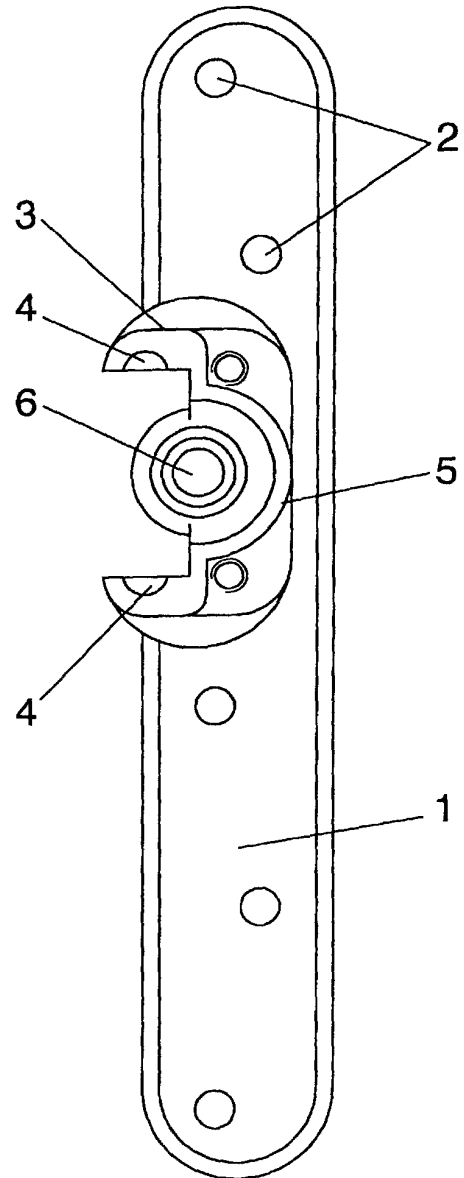


Fig. 2

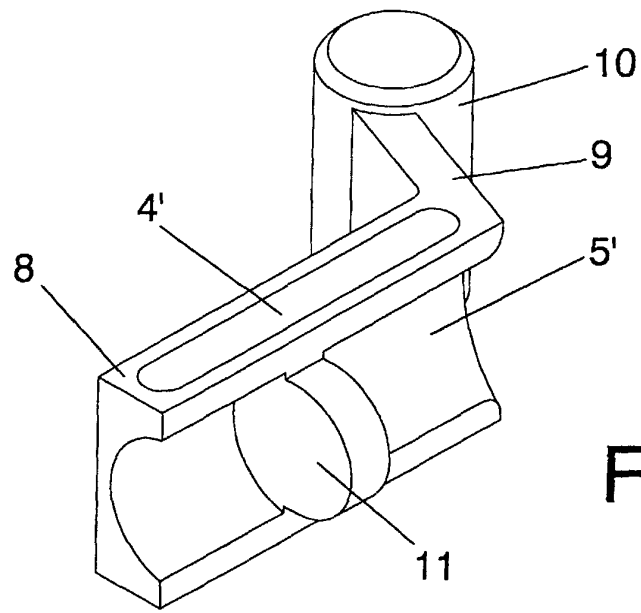


Fig. 3

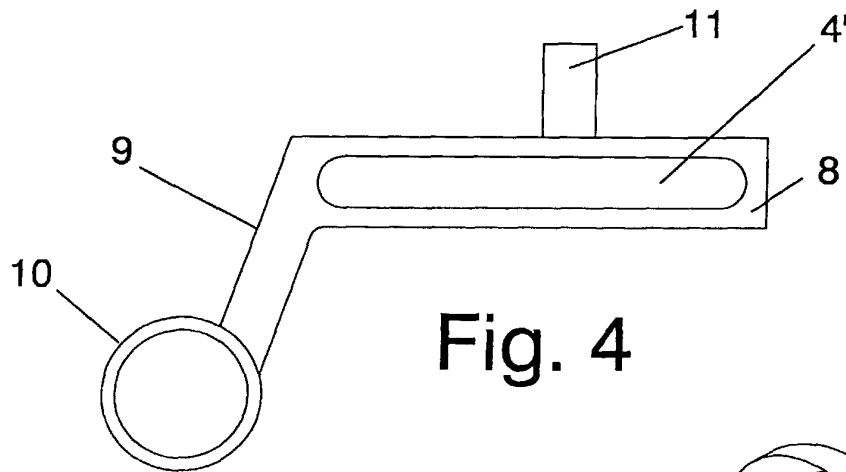


Fig. 4

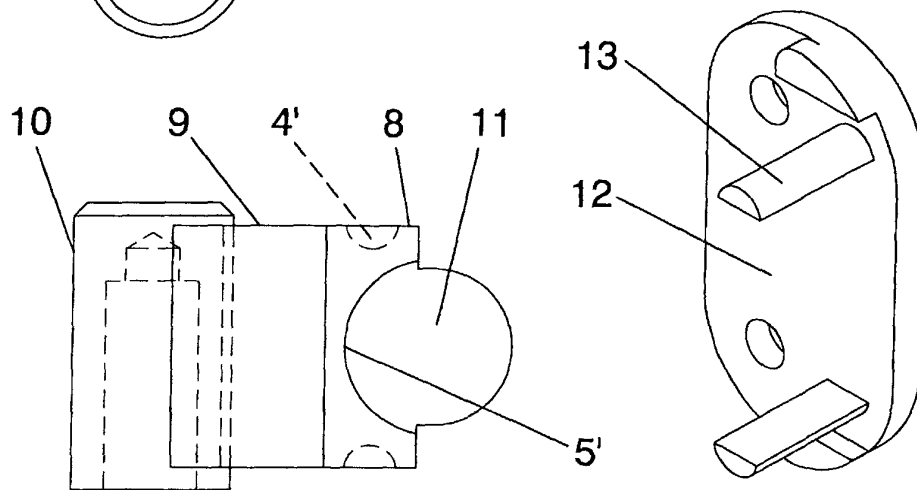


Fig. 5

Fig. 6

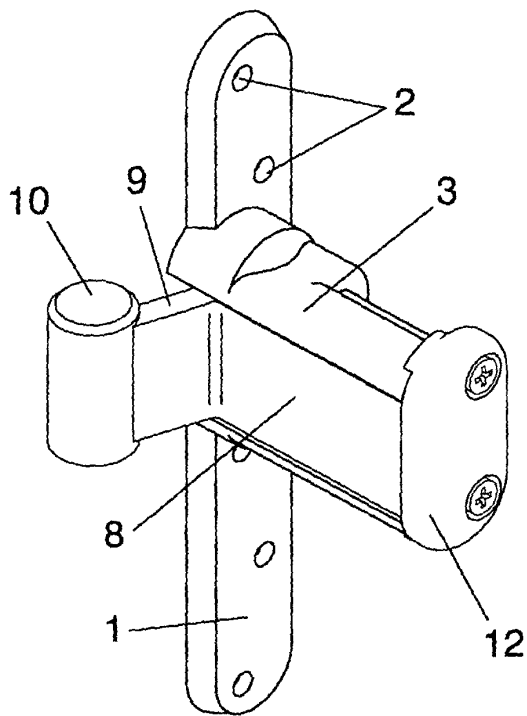


Fig. 7

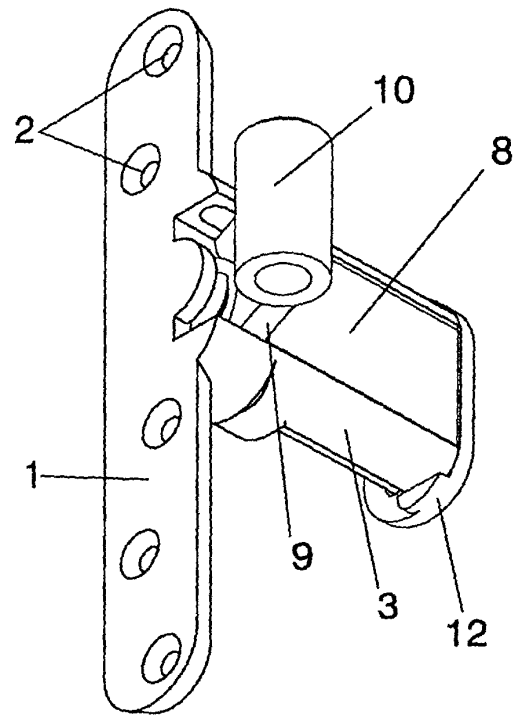


Fig. 8

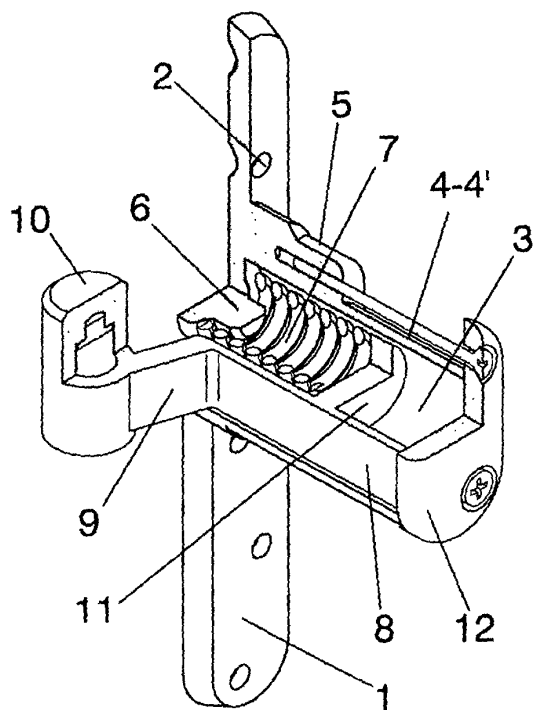


Fig. 9

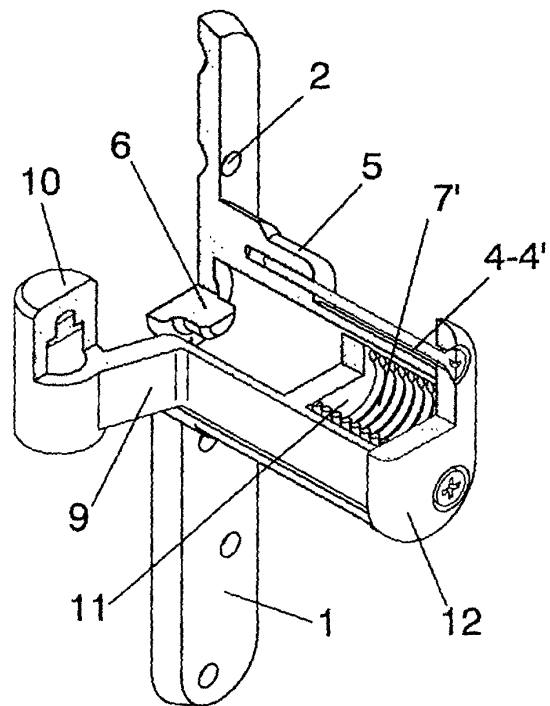


Fig. 10

INTERNATIONAL SEARCH REPORT

International application No.
PCT/ES 01/00096

A. CLASSIFICATION OF SUBJECT MATTER IPC 7 E05D7/06, 7/084, 3/06, E06B3/88 According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols) IPC 7 E05D, E06B		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practical, search terms used) CIBEPAT, EPODOC, WPI		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 98/16708 A (HETLAND,Ove) 23 April 1998 (23.04.98), the whole document.	1
A	FR 2571417 A (LEBRUN, Marc) 15 April 1986 (15.04.86), the whole document.	1
A	US 2883699 A (Frank J. GROSS) 28 April 1959 (28.04.59), the whole document.	1
A	US 1840211 A (Emanuel J. REINHART) 05 January 1932 (05.01.32), the whole document.	1
A	CH 369042 A (Rudolf L. KUNDL) 30 April 1963 (30.04.63). See Figures 8, 9.	1
A	GB 2252787 A (STOVES Ltd.) 19 August 1992 (19.08.92). See Figures 1,4.	1
A	US 2620509 A (Richard T. KEATING) 9 December 1952 (9.12.52). See Figures 2,4.	1
P, A	EP 1004734 A (Ralph RAZMOND) 31 May 2000 (31.05.00), the abstract, column 3, lines 15-50, figures 2-4.	1
☐ Further documents are listed in the continuation of box C. ☒ Patent family members are listed in annex.		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 15 June 2001 (15.06.01)		Date of mailing of the international search report 22 June 2001 (22.06.01)
Name and mailing address of the ISA/ S.P.T.O		Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (July 1998)

INTERNATIONAL SEARCH REPORT
 Information on patent family members

 International Application No
 PCT/ES01/00096

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